January 1979 A.E. Res. 79-5

DAIRY MANAGEMENT PRACTICES AND NEW YORK DAIRY FARM INCOMES

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Foreword

This publication is part of a study supported by a special temporary grant to the Agricultural Experiment Station at Cornell University by Agway, Inc., of Syracuse, New York.

Dairy management practices are one area of factors that affect dairy farm incomes. Economic data on these practices are limited. Data available from the dairy herd improvement records and the farm business management projects were used to study the effects of dairy management practices on farm incomes in 1977.

The 1977 report is an update of a similar study done by Anita Graves Null, a candidate in the Cornell Graduate School for a Master of Professional Studies degree in agricultural economics for the years 1975 and 1976 under the supervision of C. A. Bratton, professor of farm management. James Lamkey did the statistical work on the 1977 data.

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Introduction

Dairy herd improvement associations have provided dairy farmers with records of their milk production for many years. In New York, the D.H.I. records system is sponsored jointly by the Animal Science Department at Cornell University and the New York Dairy Herd Improvement Cooperative. In recent years, computer facilities have made it practical to provide each cooperator with considerable detail on the dairy management practices used in his herd.

Farm business management record projects have been sponsored jointly by the Department of Agricultural Economics at Cornell and the County Extension Associations since 1955. Dairy farmers who cooperate in these projects are provided with detailed individual business financial operating summaries for the year. In recent years, these summaries have been done with computer facilities.

Production practices are an important part of the management of any dairy farm business. The efficiency of the practices used have a bearing on the income from the farm business. With the two separate record systems kept by New York dairy farmers, the effects of the dairy management practices on the farm operator's income in the past have not been analyzed. For the 1974 record year, a pilot project was undertaken to merge the two record systems and study the effects that selected dairy management practices had on the business incomes. This project proved to be workable and provided useful data.[1] To supplement the pilot effort, a similar project was undertaken using the 1975 and 1976 records, and the results were reported in A.E. Res. 77-20. The study of the 1977 records are reported in this publication.

Methodology

To execute this study, farm business summary records from the Department of Agricultural Economics at Cornell were combined with the dairy herd improvement records from the Animal Science Department. The purpose was to combine financial records with production records and study how well various production practices pay. From the existing records, dairy farms that participated in both programs were identified, and the production and income data were merged on computer tapes. This made it possible to sort by any of the factors available on the merged tapes, and to compute various production and income measures for each factor. The results were recorded in cross tabulation tables.

Farmers have traditionally used these record systems to report and analyze information on their dairy operation which in turn can be used in making management decisions, and as a method of comparing their performance with that of other farmers. These records when combined contain a wealth of information with over two hundred possible variables which can be used for applied research purposes. Sixteen of the more than 200 variables were chosen for analysis in this study. Definitions of the measures used in this study are described below.

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[1] Results published in Cornell Agricultural Economics Staff Paper 75-27 and in A.E. Res. 78-19.

Definitions of Measures Used

Four measures used in the farm business summaries, and fifteen measures from the dairy herd improvement records are defined below. These are general definitions for working purposes in this research. Details concerning the calculation procedures can be obtained from the Department of Agricultural Economics or the Department of Animal Science.

Labor and management income per operator reflects the dollar return to the farmer-operator for his time, knowledge and skills in operating the entire farm business. For calculation details, see Cornell's A.E. Res. 78-8.

Milk sold per cow is the yearly poundage of all milk sold divided by average number of cows. This is lower than milk produced per cow by the amount used by the family, wasted, or fed to the animals.

Average number of cows is a measure of herd size and is a 12-month average of the milk cows as reported in the farm business summary.

Number of cows per person is calculated by dividing herd size by the person equivalent.

Milk produced per cow is the total pounds of milk produced by each cow as computed from the twelve monthly dairy herd improvement sample weights. The herd average was used in this study for all dairy management practices.

Butterfat test is the herd average for the twelve monthly dairy herd improvement samples tested.

Concentrates fed is the calculated yearly average pounds of concentrates fed per cow in the herd. The D.H.I. supervisor records the pounds of concentrates fed during each monthly test period. These are aggregated for the yearly figures.

The percent net energy figures are calculated for concentrates, succulants (silages), dry hay, and pasture. It reflects the relative amount of available therms (calories) the cow gets from each source.

Body weight of all cows is rounded to the nearest ten pounds. This measure indicates the average weights of all cows in the herd during the year. It is an indicator of size of animals. Body weights are obtained by taping the animal.

Body weight at first calving is also rounded to the nearest ten pounds. The body weight at first calving is likely to be lower for heifers that calve earlier.

Age at first calving is expressed in months. Heifers that cycle earlier can be bred earlier.

Projected minimum calving interval is the herd average of the number of months between calves.

Breedings per conception is the number of times a cow is bred before she is settled.

Days dry measures the number of days a cow is not milked per calving interval.

Percent of days in milk is an aggregated measure reflecting efficiency in days dry, days open, and projected minimum calving interval. It is the number of days milked divided by the number of days on test (usually 365).

Percent leaving the herd was calculated by dividing the number of cows leaving the herd during the year for purposes other than dairy (slaughter) by the herd size times one hundred.

Age of all cows is also expressed in months, and is the average age of all milk cows in the herd during the year. The ages of heifers are not averaged in.

The feeding index equals the reported total net energy fed per cow divided by the calculated maintenance and production requirements times one hundred. It is an efficiency measure of the feeding practices being followed.

Income over value of feed is the computed value of the milk produced minus the value of all feed fed. Value of feed is calculated by the farmer and dairy herd improvement representative. This measure reflects just the one cost variable, namely, feed. For 1976 it had a low correlation (r=.20) to labor and management income per operator (see p. 32, A.E. Res. 77-20).

Procedures Followed

A computer listing of the farm business summary farms (dairy only) that indicated they had dairy herd improvement records was obtained. By going to the Animal Science Department, the dairy herd improvement identification numbers for these farms were obtained. Farms (D.H.I.) with less than 365 days of records, milk only records, or "high-medium-low" feeding records were discarded for study purposes. Some of the larger farms had two dairy herd improvement records for different milking herds which made it difficult to merge this information with the farm business financial data, so they too were discarded from the study. Once farms from the two sources were definitely identified and matched, the information selected for analysis was punched on individual computer cards and taken to the Agricultural Economics Department where it was merged with the farm business summary information. As an additional check, a program was run to print out both code numbers and the herd size for each farm for the two record systems. If the herd size for the two systems differed by more than ten percent, it was assumed that the records did not match and the records were not used.

There were 413 farms in 1974, 380 in 1975, 337 in 1976 and 363 in 1977. The 1974 study did not have the final check comparing cow numbers which eliminated a number of farms for the later years. The 1976 study was missing data from one county because of identification procedures used. Thus the decrease in number of farms in 1976 does not reflect a trend in the number of herds with both types of records.

A computer program sorted the data into the various groupings, and the average values for all the factors in each group were printed out. These data were put in cross tabulation tables. When X is sorted into several groups of increasing value and its effect on Y is examined, the way to read this is: "as X increases, Y . . . ." No one farm will match the averages in a group.

The findings of this study will be useful for broad policy recommendations in New York State, for individual use, for farmers to compare their performance to the norm, and for showing the basic relationships of dairy management practices to milk sold per cow and to labor and management income per operator.

Analysis of Farm Business Management Variables

The relationship between production practices and financial measures was examined by sorting first one then the other and observing the effects. Background material such as percent of farms in each group and average herd size in each group are given to acclimate the reader. The 1977 data are reported in the tables presented in this publication.

Labor and Management Income Per Operator and Herd Size

The most common measure of success used by farm managers is labor and management income per operator. The income situation during the years studied showed 1976 to be the best year, while 1975 was much poorer with 21 percent of the farms reporting an income to the operator of less than $-5,000 per operator. In 1974, 18 percent of the farms had labor and management income per operator of less than $-5,000 compared with the 12 percent for 1976 (table 1).

Table 1. LABOR AND MANAGEMENT INCOME PER OPERATOR AND RELATED FACTORS New York Dairy Farms, 1974, 1975, 1976, and 1977

Labor & Management Income Per Operator	Percent of Farms				Average Number of Cows			
	1974	1975	1976	1977	1974	1975	1976	1977
$-5,000 or less	18	21	12	21	75	78	65	71
$-4,999 to $-1	15	15	10	13	60	63	59	67
0 to $ 4,999	18	22	19	21	70	61	67	61
$ 5,000 to $ 9,999	20	17	21	21	63	71	64	63
$10,000 to $14,999	14	11	15	11	71	74	64	62
$15,000 to $19,999	7	8	11	6	87	85	71	81
$20,000 & over	8	6	11	6	128	127	106	116

The weather situation in 1976 was not as good as in 1975, the milk price situation was more favorable. This more than compensated for the effects of low yields in 1976.

The size of herd as measured by the average number of cows tended to increase as labor and management income increased except at the minus income levels (table 1). The "better" managers in general had more cows. The fact that the farms with the largest losses had larger herds seems to indicate that when a larger farm is mismanaged or experiences low prices for milk, income falls further than a smaller farm since inefficiencies are magnified.

When the farms were sorted by herd size, the labor and management income per operator showed a positive correlation with size (table 2). About half of the farms in this study had between forty and seventy cows. The farms with 100 to 149 cows had the highest labor and management income per operator in 1977 and was more than double that of the modal size herds of 40 to 54 cows.

Table 2. HERD SIZE AND LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms 1974, 1975, 1976, and 1977

Number of Cows	Percent of Farms				Labor & Management Income/Operator			
	1974	1975	1976	1977	1974	1975	1976	1977
Under 40	10	11	12	13	$ 2,540	$1,348	$ 2,932	$(126)
40 to 54	29	26	28	28	2,698	2,479	5,955	2,540
55 to 69	22	23	25	23	2,482	3,590	7,208	2,269
70 to 84	12	12	13	15	3,841	45	9,346	4,918
85 to 99	7	8	7	6	10,539	5,347	7,898	4,724
100 to 149	14	14	10	10	7,308	8,870	13,223	6,515
150 & over	6	6	5	5	14,853	8,548	15,462	4,645

Milk Sold Per Cow and Herd Size

Milk sold per cow was a second major output variable examined. The background situation showed a trend toward more farms in the higher production per cow groupings over the years (table 3). In 1974, only nine percent of the farms sold 15,000 or more pounds of milk per cow; in 1975, seventeen percent of the farms attained this level of milk sold per cow; in 1976, twenty percent; and in 1977 thirty percent were at this level.

Table 3. MILK SOLD PER COW AND RELATED FACTORS
New York Dairy Farms, 1974, 1975, 1976, and 1977

Milk Sold Per Cow	Percent of Farms				Average Number of Cows			
	1974	1975	1976	1977	1974	1975	1976	1977
Under 10,000	8	4	4	4	71	53	48	49
10,000 to 10,999	10	6	5	5	68	72	57	56
11,000 to 11,999	14	16	10	7	70	64	59	53
12,000 to 12,999	20	16	18	15	75	74	66	59
13,000 to 13,999	23	23	20	22	73	79	75	74
14,000 to 14,999	16	17	23	17	77	74	77	76
15,000 to 15,999	6	11	13	18	88	87	71	79
16,000 & over	3	6	7	12	74	76	71	69

It appears that the farms selling more milk per cow had more cows (were larger) up to the group with over 16,000 pounds sold per cow. The farms selling less than 12,000 pounds of milk per cow, in general, averaged fewer cows per farm than those with higher rates of production (table 3). This may indicate that the larger farmers watch production practices more closely than the smaller farmers. When herd size was controlled and milk sold per cow examined, this hypothesis seemed to be borne out as shown in table 4.

Table 4. HERD SIZE AND MILK SOLD PER COW
New York Dairy Farms, 1974, 1975, 1976, and 1977

Average Number of Cows	Average Pounds of Milk Sold Per Cow			
	1974	1975	1976	1977
Under 40	12,788	13,059	13,281	13,572
40 to 54	12,765	13,520	13,460	13,776
55 to 69	12,707	13,013	13,549	13,857
70 to 84	12,823	12,997	13,862	14,589
85 to 99	13,156	13,384	14,020	14,174
100 to 149	13,236	13,803	14,154	14,323
150 & over	12,965	14,017	14,201	14,577

Three factors were chosen from the 1977 study to further examine the relation of herd size and rates of production. The factors were: cows per person which measures labor efficiency; pounds of concentrates fed per cow, a feeding practice; and average days dry which is a breeding practice.

Table 5. HERD SIZE AND SELECTED FACTORS
363 New York Dairy Farms, 1977

Average Number of Cows	Average Cows Per Person	Pounds of Concentrates Fed Per Cow	Average Days Dry
Under 40	21	5,178	66
40 to 54	25	5,364	64
55 to 69	28	5,334	60
70 to 84	28	5,886	61
85 to 99	33	5,633	58
100 to 149	34	6,604	57
150 & over	35	6,568	57
	(increases)	(increases)	(decreases)

The larger herds had better labor efficiency as measured by cows per person (table 5). The farms with 40 or less cows averaged 21 cows per person equivalent, while those with 150 or more averaged 35 cows per person, or 70 percent more. The larger herds fed more concentrates per cow. The herds with 150 or more cows fed an average of 6,568 pounds per cow, while those with 40 or less cows only fed 5,178 pounds per cow. The average days dry was related to size of herd with the larger herds having fewer days dry per cow.

Labor and Management Income Per Operator and Milk Sold Per Cow

The Pearson correlation analysis made in 1976 showed an r value of .26 between the two major output variables, labor and management income per operator and milk sold per cow. This means there are many other factors involved in specifying these variables; however, the fact the relation is positive indicates that as one factor increases the other does too.

Table 6. MILK SOLD PER COW AND LABOR AND MANAGEMENT INCOME PER OPERATOR New York Dairy Farms, 1974, 1975, 1976, and 1977

Labor & Management Income Per Operator	Pounds Milk Sold Per Cow			
	1974	1975	1976	1977
$-5,000 or less	12,204	12,978	12,752	13,785
$-4,999 to $-1	12,247	12,705	12,817	13,542
0 to $ 4,999	12,519	13,436	13,430	14,246
$ 5,000 to $ 9,999	13,113	13,662	13,836	13,975
$10,000 to $14,999	13,276	14,315	13,948	14,484
$15,000 to $19,999	13,608	13,935	14,375	14,636
$20,000 & over	14,276	14,128	14,679	14,834

In general, for the four years studied, the higher income farmers had higher producing cows (table 6), and the more production per cow the higher the income as measured by labor and management income per operator (table 7). The drop in labor and management income per operator in the highest production groups (15,000 & over pounds per cow) may be due to an over concentration of effort in one practice (production) with a consequential neglect of other practices such as cost control. This phenomenon of over concentration in one area appears in other parts of this study. An examination of labor and management income per operator, and milk sold per cow in relation to the selected production practices, will help operators select a package of practices that will increase their dollar returns from the dairy business. In this study, only the production practices were analyzed, but efficient operation of all phases of a dairy enterprise is required for a profitable operation. The effects of general farm business management factors on income for 1977 are reported in Cornell A.E. Res. 78-8.

Table 7. MILK SOLD PER COW AND LABOR AND MANAGEMENT INCOME PER OPERATOR
New York Dairy Farms, 1974, 1975, 1976, and 1977

Milk Sold Per Cow	Labor & Management Income/Operator			
	1974	1975	1976	1977
Under 10,000	$-4,574	$-5,343	$-2,760	(6,585)
10,000 to 10,999	300	-2,404	516	(2,990)
11,000 to 11,999	143	1,323	3,836	3,534
12,000 to 12,999	4,999	794	4,536	(35)
13,000 to 13,999	7,052	5,847	10,526	4,151
14,000 to 14,999	8,980	6,280	9,061	5,606
15,000 to 15,999	13,105	8,943	13,649	4,294
16,000 & over	11,045	6,548	11,834	5,370

The Pearson correlation analysis made for 1976 showed only a small direct relation between the production variables and labor and management income per operator, due to the masking effect of several important financial management measures. Concentrate fed per cow, income over value of feed, and average body weight of all cows showed a relatively high correlation with pounds of milk sold per cow (table 35, A.E. Res. 77-20). An examination of the tables that follow will provide an intuitive understanding of the effects of the production variables on the two output measures used in this analysis, namely, labor and management income per operator, and pounds of milk sold per cow.

The analysis of dairy herd improvement variables which follow is divided into three general classifications; feeding practices, breeding practices, and culling practices.

Analysis of Feeding Practices

Concentrates fed; percent net energy from concentrates, succulents, and hay; average body weight of all cows; and average body weight at first calving are examined in this section.

Concentrates Fed Per Cow

Concentrates fed per cow in 1976 had a Pearson correlation value of .51 with milk sold per cow indicating a definite, increasing relationship. The more concentrates a cow was fed, the more milk she gave; and conversely, the more milk a cow gave, the more concentrates she was fed (tables 8 and 9). Genetic potential and absolute level of feeding must be considered in examining this factor since increasing feed will not necessarily increase production infinitely. It is assumed that in these herds the genetic potential was greater than the feeding levels being practiced. A good dairy manager in principle aims to add more feed as long as it increases the dollar value of output by more than the cost of the feed.

Table 8. POUNDS OF CONCENTRATES FED PER COW AND RELATED FACTORS
363 New York Dairy Farms, 1977

Pounds of Concentrates Fed Per Cow	Percent of Farms	Average Number of Cows	Pounds Per Cow			Pounds Milk Sold Per Lb. of Concentrates	Labor & Mgt. Income/ Operator
			Concentrates	Milk Sold	Milk Produced		
3,000 or less	1	39	2,764	11,518	12,007	4.2	$2,849
3,001 to 4,000	10	54	3,668	11,752	12,358	3.2	752
4,001 to 5,000	23	58	4,561	13,176	13,875	2.9	3,209
5,001 to 6,000	34	68	5,473	14,128	14,853	2.6	4,068
6,001 & over	32	79	7,070	15,123	16,204	2.1	2,495

Dairymen commonly base their rate of concentrate feeding on the milk production. For the 1977 data, the ratio of concentrates fed per cow to the pounds of milk sold per cow was calculated for the five groups studied. The greater the amount of concentrates fed per cow the lower the ratio of milk to concentrates (table 8). The farms feeding less than 3,000 pounds of concentrates per year had a ratio of 4.2, while those feeding over 6,000 pounds had a ratio of 2.1. The farms with the lower milk to feed ratio also had higher labor and management incomes per operator. This suggests that feeding concentrates at a relatively high level was a profitable practice in 1977.

Table 9. OUTPUT MEASURES AND CONCENTRATES FED
355* New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Pounds Concentrates Fed Per Cow	Labor & Management Income Per Operator	Pounds Concentrates Fed Per Cow
Under 10,000	3,793	$-5,000 or less	5,668
10,000 to 10,999	4,483	$-4,999 to $-1	5,517
11,000 to 11,999	4,494	0 to $ 4,999	5,263
12,000 to 12,999	5,131	$ 5,000 to $ 9,999	5,713
13,000 to 13,999	5,565	$10,000 to $14,999	5,550
14,000 to 14,999	5,697	$15,000 to $19,999	5,946
15,000 to 15,999	6,350	$20,000 & over	6,094
16,000 & over	6,796		

* Not available for 8 farms.

To observe the relationship of concentrates fed per cow to the output measures, the farms were sorted on the basis of output factors. When the farms were grouped on the basis of pounds of milk sold per cow, the higher the rates of production, the greater the amount of concentrates fed (table 9). The farms with 16,000 pounds or more milk sold per cow were feeding 80 percent more concentrates as those producing under 10,000 pounds per cow. The data in table 9 are the counter examination of the relationship observed in table 8 and is a further substantiation of the effects of rate of concentrates fed on the production per cow.

When the farms were sorted on the basis of labor and management income per operator, the pounds of concentrates fed tended to be greater on the farms with higher incomes. An exception to this was the farms with relatively large minus labor incomes and, as observed elsewhere, these tend to be larger, better operated farms that for some reason are inefficiently managed in the area of cost control and, therefore, experience large losses. The spread in rates of concentrates fed per cow were not as great for the income sort as for the pounds of milk sold which is logical since more factors affect the income measure than the rate of production measure. In both cases, the output sorts further substantiate the findings of the sorts based on concentrates fed.

Table 10. POUNDS OF CONCENTRATES FED PER COW BY YEARS
New York Dairy Farms, 1974, 1975, 1976, and 1977

Pounds of Concentrates Fed Per Cow	Percent of Farms				Lbs. of Milk Per Lb. of Concentrates			
	1974	1975	1976	1977	1974	1975	1976	1977
3,000 or less	7	6	3	1	4.5	4.6	4.7	4.2
3,001 to 4,000	17	13	9	10	3.3	3.4	3.4	3.2
4,001 to 5,000	36	33	27	22	2.8	2.9	2.9	2.9
5,001 to 6,000	27	29	30	31	2.5	2.5	2.5	2.6
6,001 & over	13	19	31	34	2.1	2.1	2.1	2.1

In 1974, only 13 percent of the farms were feeding over 6,000 pounds of concentrates per cow, but in 1977 this had increased to 34 percent of the farms. At the lower rates of feeding, 24 percent of the farms were feeding less than 4,000 pounds per cow in 1974 but in 1977 only 11 percent were at this rate. This is a sizable shift and indicates the responsiveness of dairymen to changes in milk-fed price ratios.

Over the four years studied, the average pounds of concentrates fed per cow increased from 4,811 pounds in 1974, to 5,059 pounds in 1975, to 5,433 pounds in 1976, and to 5,595 pounds in 1977. This increase in rate of concentrate feeding probably was due in part to the more favorable ratio of milk prices to feed costs in 1976 and 1977 as shown below:

Milk-Feed Price Ratios

Item	1974	1975	1976	1977
Average milk price[1]	$8.24	$8.64	$9.86	$9.76
Average cost of 16% dairy ration[2]	$6.90	$6.60	$7.20	$6.97
Milk-feed price ratio	1.2	1.3	1.4	1.4

The concentrate feeding rate in relation to milk produced is another factor examined (table 10). Again this shows the changes that occurred in the four year period. The average pounds of concentrates fed by the high group (over 6,000) increased from 6,753 in 1974, to 6,848 in 1975, to 6,926 in 1976, and 7,070 in 1977. This suggests that the upper rates of feeding moved upward with more favorable milk-feed ratios. The milk-feed ratios varied widely within each of the four years.

Table 11. POUNDS OF CONCENTRATES FED PER COW AND COSTS AND RETURNS
New York Dairy Farms, 1974, 1975, 1976, and 1977

Pounds of Concentrates Fed Per Cow	Feed Bought Per Cow				Income Over Feed Cost Per Cow			
	1974	1975	1976	1977	1974	1975	1976	1977
3,000 or less	$284	$274	$308	$248	$604	$599	$704	$733
3,001 to 4,000	282	301	318	314	618	663	804	729
4,001 to 5,000	320	306	342	380	693	684	837	800
5,001 to 6,000	381	343	402	401	702	729	890	848
6,001 & over	357	371	418	436	719	723	925	906

Pounds of concentrates fed per cow is a measure reported by the D.H.I. records, while cost of feed bought per cow is a measure from the farm business records. The feed bought per cow is affected by the quantities of home grown feed available and by relative prices paid which is often influenced some by quantity purchased. In general, the amount spent per cow for purchased feed was greater in 1977 than in 1974, a reflection of a combination of higher prices and heavier feeding. The average for all farms in 1974 was $335 but in 1977 it was $402.

1 A.E. Res. 78-8 ($/cwt.)

2 N.Y. Agricultural Statistics, 1977, Release #41 (converted to $/cwt.).

Income over feed cost is a D.H.I. measure. This indicates the amount that the value of milk produced exceeds the calculated value of all feed fed. It is a computed value and is not the actual receipts or costs as reported in the farm business records. The income over feed cost for all five groups was considerably higher in 1977 than in 1974 and 1975. In all four years, the income over feed cost per cow was greater for the farms feeding more concentrates per cow (table 11). In 1974 and 1975, the difference in income over feed cost between the high and low rates of feeding groups was about $100, while in 1976 and 1977 it was $200. In general, the spread widens as the milk-feed ratio increases.

Percent Net Energy From Concentrates, Succulents, and Dry Hay

The dairy production records include detailed information on the kinds and amounts of feed fed to the cows in the herd. The feeds fed provide the energy used by the cow for maintenance and production purposes. With the information obtained each month, it is practical with computer facilities to calculate a number of measures related to the feeding practices. Among these measures is the percent of net energy from each of the four kinds of feed used, namely, concentrates, succulents, dry hay, and pasture. The succulents include corn silage, haylage, green chop, and any other of the silage type of feeds.

Dairymen combine sources of feed in various ways to provide the energy needed by their cows. It would be possible to describe various feeding systems such as "all silage" or "hay and concentrates," and then classify the farms under these systems and study the effects of the system on income. Working out a system for classifying the farms was not readily available so for this study variations in the percent net energy provided by the four major sources was used as a basis for analysis.

For the 363 farms included in the 1977 study, the average of the sources of net energy were distributed as follows: concentrates 48 percent, succulents 32 percent, dry hay 13 percent, and pasture 8 percent. This indicates that roughages, which are usually grown on the farm, provided 52 percent or more than half of the net energy, while 48 percent was provided by concentrates, which may all have been purchased, or may have been part purchased and part from grains grown on the farm. The various combinations used would be many.

Relationship between variations in the sources of net energy and the production per cow and the labor and management income per operator are reported below. It must be kept in mind that there are many other factors that are interrelated and also have an effect on the two output or result measures. This is an examination of simple direct relationships.

Nine percent of the farms reported that less than 30 percent of the net energy came from concentrates. Sixty-four percent, or nearly two-thirds of the farms were in the range of 40 to 54 percent of the net energy from concentrates (table 12).

Table 12. PERCENT NET ENERGY FROM CONCENTRATES AND RELATED FACTORS
355* New York Dairy Farms, 1977

Percent Net Energy from Concentrates	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Labor & Management Income Per Operator
Under 30	9	83	14,751	$ 7,722
30 to 34	2	46	12,076	2,076
35 to 39	8	56	12,779	3,472
40 to 44	17	63	13,275	2,547
45 to 49	28	64	14,020	2,887
50 to 54	19	65	14,797	2,233
55 to 59	11	75	14,683	238
60 & over	5	100	14,517	3,891

* Not available for 8 farms.

In general, the higher the percent of net energy from concentrates the higher the average production per cow. Also, the farms with more net energy from concentrates were larger as measured by the number of cows. There was no apparent relationship between the percent of net energy from concentrates and labor and management income per operator.

Table 13. PERCENT NET ENERGY FROM SUCCULENTS AND RELATED FACTORS
318* New York Dairy Farms, 1977

Percent Net Energy from Succulents	Percent of Farms	Number of Cows	Percent Net Energy from Concentrates	Pounds Milk Sold Per Cow	Labor & Management Income Per Operator
0	2	64	50	13,569	$ 5,487
1 to 4	1	44	48	12,436	-15,556
5 to 9	2	42	52	13,405	2,803
10 to 19	9	47	48	13,653	2,827
20 to 29	25	54	48	13,552	3,346
30 to 39	29	70	49	14,450	768
40 to 49	25	82	46	14,228	4,738
50 & over	7	96	41	13,722	2,233

* Not available for 45 farms.

Interest in silage feeding has increased in recent years. The use of hay crops for silage purposes seems to be increasing. In the D.H.I. records, all silages are included under the classification of succulents. These accounted for 32 percent of the net energy for the 318 farms in the 1977 study but varied widely among the farms.

Two percent of the farms reported no succulents fed (table 13). This would mean they depended on hay and pasture for roughage. These farms did report a higher percentage of the net energy from concentrates (50%) than the farms that used succulents. At the other extreme, there were seven percent of the farms that provided 50 percent or more of the net energy from succulents.

In general, the farms that provided a higher percent of the net energy from succulents were larger as measured by number of cows. There was little difference (48-52%) in the percent of net energy from concentrates until 40 percent or more of the net energy was provided by succulents. The pounds of milk sold per cow tended to be higher for those with higher succulent rates. The labor and management income per operator in 1977 showed no clear relationship to percent net energy from succulents. In 1976 the incomes were higher for those feeding more succulents.

Table 14. PERCENT NET ENERGY FROM HAY AND RELATED FACTORS
318* New York Dairy Farms, 1977

Percent Net Energy from Hay	Percent of Farms	Number of Cows	Percent Net Energy from Concentrates	Pounds Milk Sold Per Cow	Labor & Management Income Per Operator
0	9	110	52	14,369	$ 4,606
1 to 4	13	94	51	14,195	771
5 to 9	20	71	48	14,234	3,971
10 to 14	17	56	48	14,289	2,043
15 to 19	20	56	46	13,900	4,260
20 & over	21	49	45	12,937	-129

* Not available for 45 farms.

Nine percent of the 318 farms reported no net energy from dry hay (table 14). On the other hand, there were 21 percent of the farms that provided 20 percent or more of the net energy from dry hay. The percent net energy from concentrates decreased as the percent from hay increased.

The farms with over 15 percent of net energy from hay sold less pounds of milk per cow. The farms with no net energy from hay had the highest average labor and management income per operator. The farms with a higher proportion of the net energy from hay were smaller as indicated by the average number of cows.

Another approach to the study of sources of net energy is to examine the farms on the basis of their rates of production and income and to determine what sources of energy they are using. The farms with the higher rates of production tended to have a slightly higher percent of the net energy from concentrates. Farms with less than 10,000 pounds of milk sold per cow obtained 41 percent of the net energy from concentrates, while those with 16,000 and over obtained 51 percent from concentrates. Farms with over 11,000 pounds of milk sold per cow obtained a higher percent of the net energy from succulents. The farms with higher rates of production depended less on hay

and pasture for energy. The farms selling under 10,000 pounds per cow obtained 35 percent of the energy from hay and pasture, while the higher production herds only obtained 17 to 18 percent (table 15).

Table 15. POUNDS OF MILK SOLD PER COW AND SOURCES OF ENERGY
318* New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Percent Net Energy			
	Concentrates	Succulents	Hay	Pasture
Under 10,000	41	25	21	14
10,000 to 10,999	43	28	16	12
11,000 to 11,999	43	33	14	10
12,000 to 12,999	46	31	15	8
13,000 to 13,999	48	34	12	6
14,000 to 14,999	48	34	11	6
15,000 to 15,999	50	33	10	7
16,000 & over	51	31	11	6

* Not available for 45 farms.

When sorted on the basis of labor and management income per operator, there were no definite relationships shown with concentrates and hay. The farms with labor and management incomes of $15,000 and over did obtain a larger proportion of the net energy from succulents and a lower proportion from hay and pasture than the lower income farms (table 16).

Table 16. LABOR AND MANAGEMENT INCOME AND SOURCES OF ENERGY
318* New York Dairy Farms, 1977

Labor & Management Income Per Operator	Percent Net Energy			
	Concentrates	Succulents	Hay	Pasture
$-5,000 or less	48	32	13	8
$-4,999 to $-1	48	33	11	8
0 to $ 4,999	46	30	15	9
$ 5,000 to $ 9,999	48	32	13	7
$10,000 to $14,999	47	34	12	8
$15,000 to $19,999	49	37	9	5
$20,000 & over	48	38	11	3

* Not available for 45 farms.

Average Body Weight of All Cows

The average body weight of all cows in 1976 had a Pearson correlation of .51 to milk produced per cow (A.E. Res. 77-20). In 1977 the larger the cow the more milk she gave. Labor and management income also increased as the average body weight for all cows in the herd increased. In general for 1977, farms with larger cows fed more pounds of concentrate per cow, sold more pounds of milk per cow, and had larger labor and management incomes per operator (table 17).

Table 17. AVERAGE BODY WEIGHT OF ALL COWS AND RELATED FACTORS
363 New York Dairy Farms, 1977

Average Body Weight All Cows	Percent of Farms	Number of Cows	Average B.F. Test	Pounds Milk Sold Per Cow	Pounds of Concentrates Fed Per Cow	Labor & Mgt. Income Per Operator
1,150 or less	11	51	3.8	11,953	4,700	$ 119
1,151 to 1,200	18	57	3.6	13,818	5,119	1,669
1,201 to 1,250	34	72	3.6	14,128	5,619	2,192
1,251 to 1,300	20	75	3.7	14,303	5,894	4,242
1,301 & over	17	80	3.7	14,781	6,283	6,974

The average body weight of all cows on the 363 farms in 1977 was 1,240 pounds. More than half the farms were in the 1,200 to 1,300 pound group (table 17). The 11 percent of the farms, which had an average body weight of all cows of 1,150 pounds or less, had an average butterfat test of 3.8, indicating that some non-Holstein herds were in this group. For other groups, average test of 3.6 and 3.7 would suggest that most of them were Holstein herds. It is also significant to note that the average herd size was larger for the groups with larger cows.

Pounds of milk sold per cow increased as the size of the cows increased. The 17 percent of the farms with average body weights of over 1,300 pounds sold 2,800 pounds more milk per cow than the 11 percent of the farms with average body weights of 1,150 or less pounds. The larger cows also were fed more concentrates than the smaller cows.

Labor and management income per operator increased as the average size of the cows increased. The farms with 1,300 pounds and over body weights had more than four times the average labor and management incomes of the farms with body weights of 1,150 to 1,200 pounds ($6,974 vs. $1,669).

When the farms were sorted on the basis of pounds of milk sold per cow, the average body weight of all cows tended to increase as the pounds of milk sold per cow increased (table 18). This is a further examination of the body weight and rate of production relationship discussed above.

The sort by labor and management income when related to body weights of the herd showed a tendency for the better income farms to have larger cows.

Body weight reflects genetic potential and age as well as feeding level. A larger cow gives more milk because she has more body resources to make milk. However, the efficiency of feed conversion to milk is important as well. The average income figures would suggest that not only did the larger cows give more milk but they did it more profitably. A generalization might be that the larger cows did pay better. The same relationships existed for the 1974, 1975, and 1976 data.

Table 18. OUTPUT MEASURES AND AVERAGE BODY WEIGHT ALL COWS
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Average Body Weight All Cows	Labor & Management Income Per Operator	Average Body Weight All Cows
Under 10,000	1,140	$-5,000 or less	1,230
10,000 to 10,999	1,180	$-4,999 to $-1	1,230
11,000 to 11,999	1,190	0 to $ 4,999	1,220
12,000 to 12,999	1,210	$ 5,000 to $ 9,999	1,240
13,000 to 13,999	1,240	$10,000 to $14,999	1,240
14,000 to 14,999	1,250	$15,000 to $19,999	1,270
15,000 to 15,999	1,270	$20,000 & over	1,280
16,000 & over	1,270		

Body Weight at First Calving

Body weight at first calving might logically be considered under practices other than feeding. Breeding practices certainly have some effect on weight at first calving. The measure is examined under the feeding section recognizing that feeding is an important factor affecting size.

Body weight at first calving in 1976 had a Pearson correlation of .64 with the average body weight of all cows in the herd. This suggests that the weight of all animals in some herds tends to be heavier due to genetic differences, feeding and breeding practices of the dairymen. Body weight at first calving also had a Pearson correlation of .35 to the age at first calving. This is logical since the animal had longer to put on weight. The cross tabulation analysis is shown in tables 19 and 20.

Table 19. BODY WEIGHT AT FIRST CALVING AND RELATED FACTORS
363 New York Dairy Farms, 1977

Body Weight at First Calving	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Pounds of Concentrates Fed Per Cow	Labor & Mgt. Income Per Operator
1,000 or less	14	50	12,210	4,791	$1,039
1,010 to 1,020	6	70	13,617	5,262	(1,278)
1,030 to 1,040	12	65	13,932	5,407	2,637
1,050 to 1,060	13	69	14,080	5,757	3,354
1,070 to 1,080	12	68	14,101	5,668	3,824
1,090 to 1,100	10	94	14,518	5,673	2,862
1,110 & over	32	70	14,743	5,962	4,620

Fourteen percent or one-seventh of the farms had an average weight at first calving of less than 1,000 pounds. On the other hand, one-third of the farms reported weights of over 1,100 pounds at first calving (table 19).

In examining the factors for the various size groups at first calving, there seems to be little direct relationship to size of herd. There was a direct relationship between weight at first calving and production per cow. Herds with larger heifers at first calving also had higher herd production averages.

Farms with larger heifers at freshening also fed more concentrates per cow. This probably indicates that dairymen who feed more concentrates to their cows also feed more to the heifers and consequently grow them to a larger size by freshening time. There appeared to be a direct relationship of weight at first calving and labor and management income per operator. The third of the farms with heifers weighing over 1,100 pounds at first calving had the highest average labor and management income with $4,620 (table 19).

Table 20. OUTPUT MEASURES AND BODY WEIGHT AT FIRST CALVING
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Body Weight at First Calving	Labor & Management Income Per Operator	Body Weight at First Calving
Under 10,000	940	$-5,000 or less	1,070
10,000 to 10,999	1,010	$-4,999 to $-1	1,070
11,000 to 11,999	1,040	0 to $ 4,999	1,060
12,000 to 12,999	1,040	$ 5,000 to $ 9,999	1,090
13,000 to 13,999	1,090	$10,000 to $14,999	1,080
14,000 to 14,999	1,090	$15,000 to $19,999	1,100
15,000 to 15,999	1,110	$20,000 & over	1,120
16,000 & over	1,120		

When the farms were sorted on the basis of milk sold per cow, there was a definite relationship with the body weight at first calving. The farms with less than 10,000 pounds of milk sold per cow had an average first calving weight of 940 pounds compared with 1,120 pounds for herds selling 16,000 or over pounds of milk per cow (table 20). The sort by labor and management income per operator was somewhat variable but those with better incomes tended to have larger first calf heifers. Those with incomes of 0 to $4,999 had first calf weights of 1,060 while those with incomes of $20,000 and over had weights of 1,120.

Analysis of Breeding Practices

Included in this section are age at first calving, projected minimum calving interval, breedings per conception, average number of days dry, and percent of days in milk.

Age at First Calving

The correlation coefficients between the output measures and age at first calving in 1976 were negative indicating an inverse relationship (A.E. Res. 77-20). As age at first calving increases, milk per cow and labor and management income per operator tended to decrease.

Table 21. AGE AT FIRST CALVING AND RELATED FACTORS
363 New York Dairy Farms, 1977

Age at First Calving	Percent of Farms	Number of Cows	Body Weight at First Calving	Pounds Milk Sold Per Cow	Labor & Mgt. Income Per Operator
Under 27	23	69	1,050	14,335	$3,132
27 to 28	29	72	1,080	14,435	1,768
29 to 30	22	75	1,080	13,888	5,362
31 to 32	13	62	1,080	14,050	3,398
33 & over	13	58	1,090	13,152	2,736

The average age at first calving for the 363 farms in 1977 was 29 months. There was a sizable range among the farms. Twenty-three percent or nearly one-fourth had average age at first calving of less than 27 months. These are in line with the recommendations of aiming to have heifers calve at two years of age. At the other end of the range, 13 percent reported average age at first calving of 33 months or more which is approaching three years of age.

The farms with the younger calving age for heifers had the larger herd size and the higher production per cow. The group with the largest labor and management income per operator averaged 29 to 30 months at first calving.

Table 22. OUTPUT MEASURES AND AGE AT FIRST CALVING
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Age at First Calving	Labor & Management Income Per Operator	Age at First Calving
Under 10,000	28	$-5,000 or less	28
10,000 to 10,999	31	$-4,999 to $-1	30
11,000 to 11,999	30	0 to $ 4,999	28
12,000 to 12,999	29	$ 5,000 to $ 9,999	29
13,000 to 13,999	29	$10,000 to $14,999	30
14,000 to 14,999	28	$15,000 to $19,999	29
15,000 to 15,999	28	$20,000 & over	28
16,000 & Over	28		

The farms were sorted on pounds of milk sold per cow and then the average age at first calving was computed. In general, the higher the herd production average, the lower was the average age at freshening (table 22). An exception is the group selling less than 10,000 pounds per cow which averaged 28 months at freshening. From previous tables, it was observed that this group included more high test herds which tend to have lower production averages.

The sort on the basis of labor and management income per operator showed relatively little differences in average age at first calving.

Body weight at first calving had a stronger correlation with milk per cow than age at first calving which helps to disguise the effects of earlier calving. It makes management sense that the sooner a heifer freshens, the more income one will derive due to savings from not carrying a nonproducing animal. One must maintain high levels of feeding, however, as this young cow will still be growing while milking.

Projected Minimum Calving Interval

The average minimum calving interval for the 363 farms in 1977 was 12.9 months. For the years 1974 and 1975, the minimum calving interval was 13.0 months. This means that the average farmer is settling his cows on the fourth month after freshening.

Table 23. PROJECTED MINIMUM CALVING INTERVAL AND RELATED FACTORS
363 New York Dairy Farms, 1977

Projected Minimum Calving Interval (Months)	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Labor & Mgt. Income Per Operator
Less than 12.5	18	59	14,015	$4,976
12.5 to 12.9	33	70	14,275	2,940
13.0 to 13.4	31	71	13,996	3,745
13.5 to 13.9	13	77	14,236	2,113
14.0 or more	5	64	13,309	-522

The lower the calving interval, in general, the more milk per cow and the more income per operator (table 23). From these data, a calving interval of less than 13.5 months seems best. A confounding problem is that high producing cows often are harder to settle, and therefore, would have a longer projected minimum calving interval.

Table 24. OUTPUT MEASURES AND PROJECTED MINIMUM CALVING INTERVAL
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Projected Minimum Calving Interval	Labor & Management Income Per Operator	Projected Minimum Calving Interval
Under 10,000	13.2	$-5,000 or less	13.1
10,000 to 10,999	12.1	$-4,999 to $-1	12.9
11,000 to 11,999	12.9	0 to $ 4,999	12.8
12,000 to 12,999	13.1	$ 5,000 to $ 9,999	12.9
13,000 to 13,999	13.0	$10,000 to $14,999	13.0
14,000 to 14,999	12.9	$15,000 to $19,999	12.9
15,000 to 15,999	13.0	$20,000 & over	12.9
16,000 & over	12.9		

When sorted by the output measures, there was no observable trend in minimum calving interval with the pounds of milk sold per cow or labor and management income per operator.

One way to decrease the calving interval is to decrease the breedings per conception by effective heat detection, by good gynecological care, and by feeding enough net energy. Another factor is how soon the dairyman aims to breed back after freshening.

Breedings Per Conception

The relationship of breedings per conception to labor and management income as shown in table 25 is what one might logically expect. The fewer breedings per conception the higher the income per operator. The pounds of milk sold per cow showed no relationship to the number of breedings per conception. This may be due to the fact that higher producing cows tend to be harder to settle.

Table 25. BREEDINGS PER CONCEPTION AND RELATED FACTORS
363 New York Dairy Farms, 1977

Breedings Per Conception	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Veterinary Expenses Per Cow	Labor & Mgt. Income Per Operator
1.4 or less	22	66	14,118	$22.14	$4,153
1.5 to 1.6	26	72	13,978	22.69	3,798
1.7 to 1.8	23	68	14,121	25.76	3,383
1.9 to 2.0	13	66	13,792	25.14	2,428
Over 2.0	15	73	14,236	28.16	1,780

Twenty-two percent of the farms reported an average of less than 1.5 breedings per conception in 1977. Fifteen percent or one out of seven reported an average of over 2.0. The average of all 363 farms was 1.7 breedings per conception. The veterinary expenses per cow increased as the number of breedings increased with the highest of $28.16 for the group with more than 2.0 breedings per conception (table 25).

Table 26. OUTPUT MEASURES AND BREEDINGS PER CONCEPTION
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Breedings Per Conception	Labor & Management Income Per Operator	Breedings Per Conception
Under 10,000	1.7	$-5,000 or less	1.7
10,000 to 10,999	1.6	$-4,999 to $-1	1.7
11,000 to 11,999	1.7	0 to $ 4,999	1.8
12,000 to 12,999	1.7	$ 5,000 to $ 9,999	1.7
13,000 to 13,999	1.7	$10,000 to $14,999	1.6
14,000 to 14,999	1.7	$15,000 to $19,999	1.6
15,000 to 15,999	1.7	$20,000 & over	1.7
16,000 & over	1.7		

When sorted on the basis of milk sold per cow, there was no difference in the number of breedings per conception (table 26). This is in line with the sort on the basis of breedings per conception. There was some indication that the breedings per conception were somewhat lower for the higher income groups.

Average Number of Days Dry

Once it was thought that a longer resting period between lactations allowed the cow to build up energy reserves which would be returned later in the form of more milk per cow. Recently, however, it has been shown that with higher levels of concentrate feeding and proper veterinary care, milk per cow and labor and management income per operator increased with fewer days dry.

Table 27. AVERAGE DAYS DRY AND RELATED FACTORS
363 New York Dairy Farms, 1977

Average Days Dry	Percent of Farms	Number of Cows	Milk Sold Per Cow	Labor & Management Income/Operator
50 or less	9	78	14,246	$ 3,399
51 to 55	16	78	15,160	6,262
56 to 60	21	76	14,049	2,784
61 to 65	21	68	13,776	4,908
66 to 70	16	60	13,795	2,503
Over 70	17	56	13,457	-584

Nine percent of the farms reported an average of 50 or less days dry (table 27). Forty-six percent or nearly one-half of the farms reported 60 days or less, which is less than two months time out of production. It is of interest to observe that the farms with the lower number of days dry were the larger herds.

Farms with fewer days dry had higher production rates as shown by the pounds of milk sold per cow. This is to be expected since they are producing more days of the year. Likewise, the farms with the fewer days dry tended to have higher labor and management incomes (table 27). It appears to pay to keep the average days dry to 60 days or less.

Farmers with higher incomes and the higher rates of production in 1977 had fewer days dry per cow (table 28). This is in line with the observations based on days dry and output shown in table 27 above.

Table 28. OUTPUT MEASURES AND DAYS DRY
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Days Dry	Labor & Management Income Per Operator	Days Dry
Under 10,000	74	$-5,000 or less	63
10,000 to 10,999	59	$-4,999 to $-1	64
11,000 to 11,999	64	0 to $ 4,999	63
12,000 to 12,999	64	$ 5,000 to $ 9,999	61
13,000 to 13,999	62	$10,000 to $14,999	62
14,000 to 14,999	60	$15,000 to $19,999	56
15,000 to 15,999	61	$20,000 & over	55
16,000 & over	57		

Percent of Days in Milk

The percent of days in milk is an aggregate measure of calving interval, days dry, and days open. In general, the higher percent of days in milk, the more milk per cow and the more labor and management income per operator (table 29).

Table 29. PERCENT OF DAYS IN MILK AND RELATED FACTORS
363 New York Dairy Farms, 1977

Percent of Days In Milk	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Days Dry	Calving Interval	Labor & Mgt. Income Per Operator
80 or less	2	45	11,004	87	13.3	$-2,391
81 to 83	10	63	13,652	72	12.8	-831
84 to 86	41	65	13,734	65	12.8	3,385
87 to 89	38	74	14,435	57	13.0	4,510
Over 90	8	81	14,653	48	13.2	1,735

Most farms were in the 84 to 89 percent of days in milk categories. Farms with the higher percent of days in milk tended to be larger as measured by number of cows. As the percent of days in milk increased, the average days dry decreased.

Table 30. OUTPUT MEASURES AND PERCENT OF DAYS IN MILK
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Percent of Days in Milk	Labor & Management Income Per Operator	Percent of Days in Milk
Under 10,000	83	$-5,000 or less	86
10,000 to 10,999	86	$-4,999 to $-1	86
11,000 to 11,999	86	0 to $ 4,999	86
12,000 to 12,999	86	$ 5,000 to $ 9,999	86
13,000 to 13,999	86	$10,000 to $14,999	86
14,000 to 14,999	86	$15,000 to $19,999	87
15,000 to 15,999	87	$20,000 & over	87
16,000 & over	87		

When the farms were sorted on the basis of milk sold per cow and labor and management income per operator, there was some observable relationship to percent of days in milk (table 30). The relationship was more evident in the pounds of milk sold per cow sort than in the sort on income.

Analysis of Culling Practices

Choosing which cows to keep, which to sell, and when, is an important but difficult management decision. To examine culling practices, two measures were used; percent of cows leaving the herd for purposes other than dairy (slaughter), and average age of all cows. Over the three years, the tendency was to cull more heavily.

Percent Leaving the Herd

In 1974, the average percent leaving the herd was 23, in 1975 it was 27, in 1976 it was 28, and in 1977 it was 29.

Table 31. PERCENT LEAVING THE HERD AND RELATED FACTORS
363 New York Dairy Farms, 1977

Percent Leaving Herd	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Labor & Mgt. Income Per Operator
Under 20	15	51	13,502	$2,668
20 to 24	22	64	14,322	4,934
25 to 29	21	78	14,171	2,948
30 to 34	19	69	14,028	1,744
Over 35	23	76	14,400	3,364

A specific percent to cull is not obvious from these data. It appears that there is a "too high" and a "too low" level for culling, with the optimum incomewise somewhere between twenty and thirty percent. This would mean keeping the cows at an average of about four lactations. Dairy herd improvement recommends not keeping a cow that does not perform well on her first lactation in the hopes the second will be better. Some animals are culled during or at the end of the first lactation. To counter balance these early culls, some cows are kept much longer than the average of four lactations. The averages used here give an overall indication of what is happening to the herd as a whole due to the culling practices.

There was no observable difference in the average herd size when the farms were sorted on the basis of percent of cows leaving the herd. The herds with culling rates of under 20 percent had the lowest rates of production as shown by pounds of milk sold per cow, but the other groups showed little difference (table 31).

Table 32. OUTPUT MEASURES AND PERCENT LEAVING THE HERD
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Percent Leaving Herd	Labor & Management Income Per Operator	Percent Leaving Herd
Under 10,000	31	$-5,000 or less	30
10,000 to 10,999	23	$-4,999 to $-1	27
11,000 to 11,999	29	0 to $ 4,999	29
12,000 to 12,999	27	$ 5,000 to $ 9,999	28
13,000 to 13,999	29	$10,000 to $14,999	26
14,000 to 14,999	28	$15,000 to $19,999	28
15,000 to 15,999	30	$20,000 & over	31
16,000 & over	29		

When sorted by labor and management income per operator and milk sold per cow, all averages fell in the 23 to 31 percent culling range. Farms with the top production averages culled between 28 to 30 percent during the year. Individual farmers should consider each cow's performance in relation to the rest of the herd and cull accordingly.

Further data would be helpful to eliminate farmers who are expanding or contracting their herd size, which affects their culling rate.*

* For a more detailed analysis of cow turnover or culling, see Cornell A.E. Res. 77-19 by Clark and Bratton.

Average Age of All Cows

It might logically be expected that the herds with a higher average age would have a higher labor and management income per operator since the costs of replacements either in raising heifers or by purchases would be less. However, this was not true for the 363 herds studied for 1977.

Table 33. AVERAGE AGE AND RELATED FACTORS
363 New York Dairy Farms, 1977

Average Age	Percent of Farms	Number of Cows	Pounds Milk Sold Per Cow	Labor & Mgt. Income Per Operator
Under 45	8	91	15,226	$ 6,674
45 to 49	27	72	14,292	4,950
50 to 54	17	77	14,186	963
55 to 59	23	58	13,233	2,964
Over 60	25	64	13,913	2,052

Nearly half of the farms had a herd average age of 55 months or over. However, the farms in the under 45 month average age group had the best labor and management income per operator. There was some variation in the pounds of milk sold per cow and the average age of the herd. The 8 percent of the farms with an average age of cows in the herd of under 45 months had the highest rate of production and the highest labor and management income of any of the age groups.

A possible explanation of younger herds producing more than older herds, could be an adherence to the D.H.I. recommendation of culling cows whose production is not up to expectations in the first year. Also, each year the genetic potential of the new cows should be somewhat better due to the improved sires being used by artificial inseminators.

Table 34. OUTPUT MEASURES AND AVERAGE AGE
363 New York Dairy Farms, 1977

Pounds Milk Sold Per Cow	Average Age	Labor & Management Income Per Operator	Average Age
Under 10,000	58	$-5,000 or less	54
10,000 to 10,999	57	$-4,999 to $-1	56
11,000 to 11,999	55	0 to $ 4,999	54
12,000 to 12,999	56	$ 5,000 to $ 9,999	54
13,000 to 13,999	55	$10,000 to $14,999	55
14,000 to 14,999	54	$15,000 to $19,999	54
15,000 to 15,999	53	$20,000 & over	52
16,000 & over	53		

When sorted on the basis of pounds of milk sold per cow, the herds with the higher rates of production had lower average ages or, in brief, were younger herds. Likewise, the higher the labor and management income, the lower the average age of the cows in the herd. This suggests that heavier culling and younger herds in general produced better and paid better. This is counter to what is usually expected and further study of this situation would appear to be in order.

Summary and Conclusions

The purpose of this project was to study selected dairy management practices and their relation to farm business management factors. Data on 13 dairy herd improvement management practices have been merged with farm business summary data for more than 300 farms for each of four years. Cross tabulation analyses were made for the thirteen factors, and a Pearson correlation analysis was performed on the 1976 records. These analyses added a new dimension to the dairy farm management business summaries and provided evidence as to whether these dairy management practices pay on typical commercial New York dairy farms.

Two farm business summary measures were used as indicators of the effects of the dairy management practices; they were pounds of milk sold per cow, and labor and management income per operator. The first measured the physical output, and the second the financial return from the entire farm business operation. Other business factors such as size of herd and costs were studied to observe interrelationships among factors within the "total" operation.

The effects of the dairy management practices were more readily apparent on the pounds of milk sold per cow than on the labor and management income per operator. This is logical since the first manifestation of the use of dairy practices is in the milk production of the cow, which is an intermediate step toward the goal of improving the income. Labor income is the final measure of the combined effects of the many components of the business. Cost control features, which are of great importance in the final income results, apply to all the production practices so are more far reaching in effects than just the physical measures. One can increase production by the use of a practice but possibly reduce the income if the added costs exceed the added dollar returns.

Observations made of the cross tabulation analysis of the various individual dairy management practices indicate that the practices did have an effect on the rates of production and the income the operator realized from the business. Among the practices that seemed to show the most observable relationships to labor and management income per operator were: pounds of concentrate fed per cow, percent of net energy from succulents, and average age of all cows. The practices showing the greatest effect on milk sold per cow were: concentrates fed, average body weight of all cows, average body weight at first calving, average age of all cows, and average number of days dry. These were substantiated by the Pearson correlation analysis made for the 1976 records.

In summary, for the four years studied, the selected dairy management practices reported in the dairy herd improvement records did have an effect on the labor and management incomes of the dairy farm operators. Some practices appeared to have greater effects than others.

Appendix Tables

Table 35. AVERAGE OF SELECTED FACTORS FOR ALL FARMS IN STUDY
New York Dairy Farms, 1974, 1975, 1976, and 1977

Factor	Average of All Farms			
	1974	1975	1976	1977
Number of farms	413	380	337	363
% farms with D.H.I.C. records	76%	76%	81%	84%
% farms with owner-sampler	24%	23%	19%	16%
% farms with free stall barns	32%	35%	32%	35%
Man equivalent	2.5	2.5	2.5	2.4
Number of cows	74	74	70	69
Number of heifers	54	58	54	51
Total crop acres	217	220	206	211
Total end inventory	$240,000	$259,000	$265,000	$283,000
Milk produced per cow	13,736	14,224	14,515	14,807
Milk sold per cow	12,904	13,457	13,694	14,083
Tons hay equivalent per acre	2.7	2.7	2.9	2.4
Tons corn silage per acre	13.6	14.2	13.2	14.3
Cows per person	30	30	28	29
Milk sold per person	382,000	398,000	383,000	401,529
Feed purchased per cow	$335	$329	$381	$402
% feed is of milk receipts	30%	28%	28%	29%
Feeding index	119	119	120	119
Rate roughage feeding	2.4	2.4	2.4	2.3
Lbs. concentrates fed per cow	4,811	5,059	5,433	5,595
% net energy from concentrates	43%	45%	47%	48%
% net energy from succulents	33%	34%	32%	32%
% net energy from hay	14%	12%	12%	13%
% net energy from pasture	9%	9%	9%	8%
Projected minimum calving interval (mo.)	13.0	13.0	12.9	12.9
Days dry	64	64	61	62
% days in milk	86%	86%	86%	86%
Breedings per conception	1.7	1.7	1.7	1.7
% leaving herd	23%	27%	28%	29%
Age at first calving (mo.)	29	29	29	29
Age all cows (mo.)	56	55	55	54
Body weight at first calving (lbs.)	1,070	1,070	1,070	1,080
Body weight all cows (lbs.)	1,240	1,240	1,240	1,240
Income over value feed	$681	$698	$874	$843
Average price received for milk	$8.61	$8.65	$9.91	$9.75
Labor & management income per operator	$5,032	$3,946	$8,080	$3,178

Table 36. SELECTED BUSINESS FACTORS BY SIZE OF LABOR AND MANAGEMENT INCOME PER OPERATOR
363 New York Dairy Farms, 1977

Factor	Labor and Management Income Per Operator						
	Below $-4,999	$-4,999 to $-1	0 to $4,999	$5,000 to $9,999	$10,000 to $14,999	$15,000 to $19,999	$20,000 or more
Number of farms	78	49	78	76	39	22	21
% of farms	21.5%	13%	21.5%	21%	11%	6%	6%
Labor & Management Income/oper.	$-12,862	$-2,320	$2,544	$6,870	$12,277	$17,623	$27,049
Barn Type							
% with free stalls	35%	40%	27%	37%	26%	59%	62%
Size of Business							
Man equivalent	2.5	2.6	2.3	2.2	2.1	2.4	3.3
Total crop acres	219	221	188	196	172	252	332
Number of cows	71	67	61	63	62	84	116
Total capital	$322,000	$287,000	$242,000	$255,000	$235,000	$312,000	$444,000
Rates of Production							
Lbs. milk sold/cow	13,875	13,542	14,246	13,975	14,484	14,636	14,834
Tons hay crops/acre (H.E.)	2.2	2.2	2.2	2.2	2.7	2.4	3.1
Tons corn silage/acre	14.2	13.6	13.7	14.7	15.0	14.2	14.5
Labor Efficiency							
Lbs. milk sold/man	391,000	352,000	386,000	406,000	431,731	490,000	529,000
Cows/man	28	26	27	29	30	33	36
Feeding Practices							
Feed bought/cow	$418	$361	$402	$408	$420	$418	$387
Lbs. concentrate fed	5,668	5,517	5,263	5,713	5,550	5,946	6,094
Feeding index	122	120	116	119	116	122	125
Rate of roughage feeding	2.3	2.3	2.3	2.3	2.4	2.4	2.5
% NE from concentrates	48%	48%	46%	48%	47%	49%	48%
% NE from succulents	32%	33%	30%	32%	34%	37%	38%
% NE from dry hay	13%	11%	15%	13%	12%	9%	11%
Breeding Practices							
% days in milk	86%	86%	86%	86%	86%	87%	87%
Projected calving interval (mo.)	13.1	12.9	12.8	12.9	13.0	12.9	12.9
Average days dry	63	64	63	61	62	56	55
Breedings per conception	1.7	1.7	1.8	1.7	1.6	1.6	1.7
Av. age at first calving	28	30	28	29	30	29	28
Av. age all cows	54	56	54	54	55	54	52
Av. weight first calving	1,070	1,070	1,060	1,090	1,080	1,100	1,120
Av. weight all cows	1,230	1,230	1,220	1,240	1,240	1,270	1,280
% leaving herd	30%	27%	29%	28%	26%	28%	31%

Table 37. SELECTED BUSINESS FACTORS BY POUNDS MILK SOLD PER COW
363 New York State Dairy Farms, 1977

Factor	Less than 10,000	10,000 to 10,999	11,000 to 11,999	12,000 to 12,999	13,000 to 13,999	14,000 to 14,999	15,000 to 15,999	More than 16,000
Number of farms	16	16	27	56	79	62	65	42
% of farms	4%	4%	7%	15%	22%	17%	18%	12%
Labor & management income/operator	$-6,585	$-2,990	$3,534	$-35	$4,151	$5,606	$4,294	$5,370
Barn Type								
% with free stalls	19%	31%	30%	40%	44%	48%	42%	29%
Size of Business								
Man equivalent	1.8	2.3	1.9	2.2	2.4	2.6	2.7	2.7
Total crop acres	154	181	162	183	219	230	244	219
Number of cows (FBS)	49	56	53	59	74	76	79	69
Total capital	$220,703	$200,000	$192,000	$241,000	$288,000	$300,000	$341,000	$331,000
Rates of Production								
Lbs. milk sold/cow	9,155	10,864	11,611	12,769	13,604	14,471	15,513	17,126
Tons hay crops/acre (H.E.)	2.0	1.9	1.9	2.0	2.4	2.5	2.8	2.4
Tons corn silage/acre	13.2	14.1	12.3	12.8	14.4	14.5	14.6	15.0
Labor Efficiency								
Lbs. milk sold/man	245,000	270,000	321,000	347,000	416,000	426,000	459,000	443,000
Cows/man	27	25	28	27	31	29	30	26
Feeding Practices								
Feed bought/cow	$293	$365	$319	$377	$395	$397	$443	$467
Lbs. concentrate fed	3,793	4,483	4,494	5,131	5,565	5,697	6,350	6,796
Feeding index	122	122	119	120	121	117	118	118
Rate of roughage feeding	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.4
% NE from concentrates	41%	43%	43%	46%	48%	48%	50%	51%
% NE from succulents	25%	28%	33%	31%	34%	34%	33%	31%
% NE from dry hay	21%	16%	14%	15%	12%	11%	10%	11%
Breeding Practices								
% days in milk	83%	86%	86%	86%	86%	86%	87%	87%
Projected calving interval (mo.)	13.2	12.1	12.9	13.1	13.0	12.9	13.0	12.9
Average days dry	74	59	64	64	62	60	61	57
Breedings per conception	1.7	1.6	1.7	1.7	1.7	1.7	1.7	1.7
Av. age at first calving	28	31	30	29	29	28	28	28
Av. age all cows	58	57	55	56	55	54	53	53
Av. weight first calving	940	1,010	1,040	1,040	1,090	1,090	1,110	1,120
Av. weight all cows	1,140	1,180	1,190	1,210	1,240	1,250	1,270	1,270
% leaving herd	31%	23%	29%	27%	29%	28%	30%	29%

Table 38. SELECTED BUSINESS FACTORS BY SIZE OF HERD
363 New York State Dairy Farms, 1977

Factor	Number of Cows in Herd						
	Under 40	40-54	55-69	70-84	85-99	100-149	Over 150
Number of farms	49	102	83	53	22	35	19
% of farms	13%	28%	23%	15%	6%	10%	5%
Labor & management income/oper.	$-126	$2,540	$2,269	$4,918	$4,724	$6,515	$4,645
Barn Type							
% with free stalls	8%	9%	27%	43%	68%	97%	100%
Size of Business							
Man equivalent	1.5	1.8	2.2	2.7	2.8	3.6	5.2
Total crop acres	103	154	192	234	271	339	516
Number of cows	32	46	61	75	91	120	181
Total capital	$137,000	$196,000	$257,000	$328,000	$369,000	$445,000	$723,000
Rates of Production							
Lbs. milk sold/cow	13,572	13,776	13,857	14,589	14,174	14,323	14,577
Tons hay crops/acre (H.E.)	1.9	2.1	2.2	2.4	2.7	2.6	3.1
Tons corn silage/acre	12.3	13.6	13.6	14.4	13.9	15.9	14.3
Labor Efficiency							
Lbs. milk sold/man	290,000	346,000	390,000	410,000	469,000	480,000	510,000
Cows/man	21	25	28	28	33	34	35
Feeding Practices							
Feed bought/cow	$427	$413	$409	$377	$399	$417	$391
Lbs. concentrate fed	5,158	5,364	5,334	5,886	5,633	6,604	6,568
Feeding index	118	119	117	120	118	128	125
Rate of roughage feeding	2.3	2.3	2.4	2.4	2.3	2.3	2.2
% NE from concentrates	47%	47%	46%	48%	48%	52%	54%
% NE from succulents	21%	29%	34%	37%	39%	42%	42%
% NE from dry hay	19%	15%	13%	10%	9%	4%	4%
Breeding Practices							
% days in milk	85%	85%	87%	86%	87%	87%	87%
Projected calving interval (mo.)	12.9	12.9	12.8	13.1	13.0	13.1	13.1
Average days dry	66	64	60	61	58	57	57
Breedings per conception	1.7	1.6	1.7	1.8	1.7	1.7	1.7
Av. age at first calving	28	29	29	29	29	28	28
Av. age all cows	56	55	54	55	55	52	49
Av. weight first calving	1,070	1,060	1,060	1,090	1,090	1,100	1,110
Av. weight all cows	1,220	1,230	1,220	1,250	1,260	1,270	1,270
% leaving herd	27%	29%	27%	27%	30%	30%	35%